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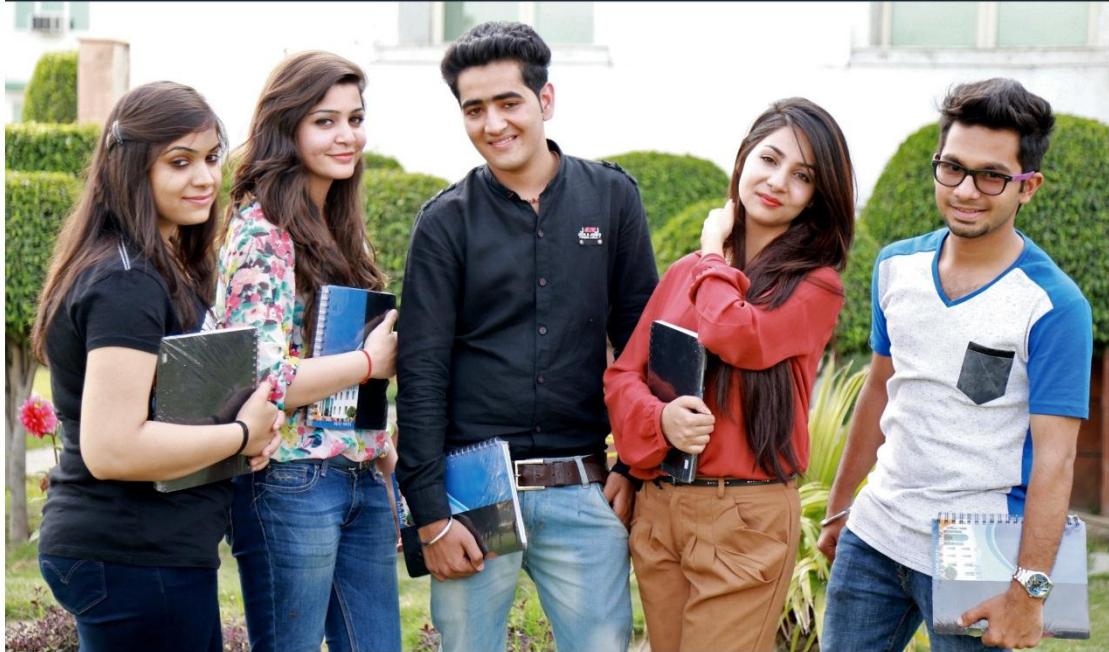INSPIRING THE LEADING EDGE TECHNOLOGIES

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Elysium PRO                                              Titles with Abstracts 2017-18

| ETPL WS - 001 | A Web Service Discovery Approach Based on Common Topic Groups Extraction |
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Web services have attracted much attention from distributed application designers and developers because of their roles in abstraction and interoperability among heterogeneous software systems, and a growing number of distributed software applications have been published as Web services on the Internet. Faced with the increasing numbers of Web services and service users, researchers in the services computing field have attempted to address a challenging issue, i.e., how to quickly find the suitable ones according to user queries. Many previous studies have been reported towards this direction. In this paper, a novel Web service discovery approach based on topic models is presented. The proposed approach mines common topic groups from the service-topic distribution matrix generated by topic modeling, and the extracted common topic groups can then be leveraged to match user queries to relevant Web services, so as to make a better trade-off between the accuracy of service discovery and the number of candidate Web services. Experiment results conducted on two publicly-available data sets demonstrate that, compared with several widely used approaches, the proposed approach can maintain the performance of service discovery at an elevated level by greatly decreasing the number of candidate Web services, thus leading to faster response time

| ETPL WS - 002 | An Approach to Web Services Selection for Multiple Users |
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Web service selection for multiple users is an important aspect for achieving efficient operations for web service applications. Its aim is to select optimal solutions, in which each abstract web service in the workflow of a web application is bound to its corresponding concrete web service with the optimal quality of service (QoS), for all users based on their QoS requirements for the workflow. There are a lot of approaches to resolve this problem, but they do not consider each user's different QoS requirements or have prohibitively large overhead for using these approaches. In this paper, we present an approach to significantly improve the efficiency of web service selection by the Advanced A-Fully Polynomial Time Approximation Scheme (A²-FPTAS) to calculate the Pareto optimal set, where each solution is not dominated by others. Additionally, this approach reduces its overhead further by adopting artificial bee colony algorithm to select an optimal solution from the Pareto set for each user. Experimental results are presented to show the efficiency of this approach

| **ETPL WS - 003** | Interconnecting Wireless Sensor Networks with the Internet Using Web Services |
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This paper presents an architecture to interconnect wireless sensor networks with the Internet, to extend the accessibility of this network. The presented solution is based in a proxy concept, using just the application layer of both networks. The objective is to verify the possibility to interconnect these different standards of network using the Hypertext Transfer Protocol and the web services technology. The real implementation and its tests suggested that is possible and viable

| **ETPL WS - 004** | Node.DPWS: Efficient Web Services for the Internet of Things |
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Node.DPWS is an implementation of the Devices Profile for Web Services (DPWS). It comprises the first set of DPWS libraries available to Node.js developers and can be used to deploy lightweight, efficient, and scalable Web services over heterogeneous nodes.

| **ETPL WS - 005** | Wake on LAN over the Internet as Web Service System on Chip |
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In this paper, we introduce a system on chip designed to run a particular Web service (WS) in an application-specific integrated circuit. The system has been designed devoid of processor and software and conceived as a hardware pattern for a trouble-free design of network services offered as WS in a service-oriented architecture (SOA). Therefore, the chip is not only able to act as a Simple Object Access Protocol service provider but also capable of registering the service on its own in an external broker server using the Universal Description, Discovery and Integration Standard publication protocol. This proposal has been named WS on chip, and its main goal is to implement more cost-effective and zero-management SOA network devices. To validate this approach, a prototypical device has been developed using a field-programmable gate array technology. The particular network service selected has been Wake on LAN (WoL) over the Internet, thus allowing any WS client to wake up any network node compatible with WoL technology. A full SOA scenario has also been developed to test the prototype functionalities and show the proposal validity

| **ETPL WS - 006** | Web 2.0 and SOA: Converging Concepts Enabling the Internet of Services |
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The increasing usage of smart embedded devices in business blurs the line between the virtual and real worlds. This creates new opportunities to build applications that better integrate real-time state of the physical world, and hence, provides enterprise services that are highly dynamic, more diverse, and efficient. Service-Oriented Architecture (SOA) approaches traditionally used to couple functionality of heavyweight corporate IT systems, are becoming applicable to embedded real-world devices, i.e., objects of the physical world that feature embedded processing and communication. In such infrastructures, composed of large numbers of networked, resource-limited devices, the discovery of services and on-demand provisioning of missing functionality is a significant challenge. We propose a process and a suitable system architecture that enables developers and business process designers to dynamically query, select, and use running instances of real-world services (i.e., services running on physical devices) or even deploy new ones on-demand, all in the context of composite, real-world business applications

| **ETPL WS - 007** | Web 2.0 and SOA: Converging Concepts Enabling the Internet of Services |
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Recently, the relationship between Web 2.0 and service-oriented architectures (SOAs) has received an enormous amount of coverage because of the notion of complexity-hiding and reuse, along with the concept of loosely coupling services. Some argue that Web 2.0 and SOAs have significantly different elements and thus cannot be regarded as parallel philosophies. Others, however, consider the two concepts as complementary and regard Web 2.0 as the global SOA. This paper investigate these two philosophies and their respective applications from both a technological and business perspective

| ETPL WS - 008 | Adaptive mobile web services facilitate communication and learning Internet technologies |
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The broad acceptance of mobile technology has undoubtedly created new opportunities in communication. The proposed environment attempts to enhance the information flow among the members of a department and, furthermore, to provide a test-bed mobile Web application for students undertaking Internet technologies courses. The key ideas are to support the educational process to provide auxiliary access to educational information sources, such as announcements, course schedules, grades, and user directory details. As a second system integration step, additional mobile Web services were introduced, such as application forms of the department's administration office, project assignment, and discussion groups. Technological evaluation and students' feedback indicate that the proposed solution is both efficient in communication perspective and effective for student involvement in the mobile Web initiative. Future steps include multimedia messages (MMS) integration and third-generation (3G)-based information delivery

| ETPL WS - 009 | Web services architecture for user control and management of optical Internet networks |
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One of the primary goals of the CA*net 4 network is to provide end users with the ability, on a peer-to-peer basis, to provision, manage, and control the routing of their own lightpaths across the network without the need to signal or request services from any central network management authority or server. A novel approach to such end-user management and control of lightpaths is described, which uses Web services architecture and grid technology

| ETPL WS - 010 | CPXe: web services for Internet imaging |
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The Common Picture eXchange environment leverages the Web services paradigm to serve the electronic photographic services market, combining open standards for exchanging digital images, orders, and other information with an online directory of service providers

| **ETPL WS - 011** | Quality of service issues in Internet Web services |
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A large fraction of Internet users access network resources through Web clients/browsers. The quality of service (QoS) experienced by their Internet users has gained great importance in recent years. Furthermore, new Web applications require the delivery of multimedia data in real time (e.g., streaming stored video and audio) and information transfer through the Internet is becoming one of the principal paradigms for business: electronic sales, banking, finance, collaborative work are a few examples of this. The QoS perceived by its users is thus becoming a dominant factor for the success of an Internet-based Web service. The principal QoS attributes users perceive include those related to the service "responsiveness", i.e., the service availability and timeliness

| **ETPL WS - 012** | Web Performance Evaluation for Internet of Things Applications |
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An area of intensive research under the umbrella of the Internet of Things (IoT) has resulted in intensive proliferation of globally deployed sensor devices that provide a basis for the development of different use-case applications working with real-time data and demanding a rich user interface. Overcoming the lack of the standard HTML platform, HTML5 specifications WebSocket and Canvas graphics strongly supported the development of rich real-time applications. Such support has been offered by browser plug-ins such as Adobe Flash and Microsoft Silverlight for years. In order to provide a deep insight into IoT Web application performance, we implemented two test applications. In the first application, we measured latencies induced by different communication protocols and message encodings, as well as graphics rendering performance, while comparing the performance of different Web platform implementations. In the second application, we compared Web performance of IoT messaging protocols such as MQTT, AMQP, XMPP, and DDS by measuring the latency of sensor data message delivery and the message throughput rate. Our tests have shown that although Adobe Flash has the best performance at the moment, HTML5 platform is also very capable of running real-time IoT Web applications, whereas Microsoft Silverlight is noticeably behind both platforms. On the other hand, MQTT is the most appropriate messaging protocol for a wide set of IoT Web applications. However, IoT application developers should be aware of certain MQTT message broker implementation shortcomings that could prevent the usage of this protocol

| ETPL WS - 013 | Hybrid testing approach for web services composition using genetic algorithm |
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Web service composition is aimed to compose new web service form to respond the goal of business process. The web service selection brings to consider accurate and reliability composition. Mostly a web service is exist tested quality of service (QoS) that is called non-functional testing described time, availability and cost. However, the web services composition need to meet the business requirement to plan the best form of composition. This paper presents framework of hybrid testing approach for web services composition using genetic algorithm in order to employ both of functional testing as equivalence class testing (ECT), which is a technique of software testing and applied to process of this web service composition and non-functional testing in order to choose the proper web service from this kind of quality testing. As a web services are various serve. In addition, web service compositions can be composed various pattern. Therefore, the problem is solved by genetic algorithm (GA). The contribution of research is to help choosing web service composition which is taken the minimum defect via proposed functional and non-functional mechanism. The experimental results are worked with different two business process goal to guide the composed web services efficiently to support suitable web service composition

| ETPL WS - 014 | Structural Analysis and Link Prediction in Dynamic Networks of Web Services |
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We propose a model of dynamic networks of Web services, which allows to define and analyze the patterns of execution of Web services. This concept is illustrated by an experiment involving two service repositories, which provide services in service composition framework. The service networks are created on the basis of the semantic bindings between the services in the repository joined with the actual patterns of the service usage resulting from composition queries. Next, a selection of link prediction methods is used to predict future usage of services, and the discussion of the applicability of link prediction to dynamic networks of services is carried out

| **ETPL WS - 015** | Search-Based Web Service Antipatterns Detection |
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Service Oriented Architecture (SOA) is widely used in industry and is regarded as one of the preferred architectural design technologies. As with any other software system, service-based systems (SBSs) may suffer from poor design, i.e., antipatterns, for many reasons such as poorly planned changes, time pressure or bad design choices. Consequently, this may lead to an SBS product that is difficult to evolve and that exhibits poor quality of service (QoS). Detecting web service antipatterns is a manual, time-consuming and error-prone process for software developers. In this paper, we propose an automated approach for detection of web service antipatterns using a cooperative parallel evolutionary algorithm (P-EA). The idea is that several detection methods are combined and executed in parallel during an optimization process to find a consensus regarding the identification of web service antipatterns. We report the results of an empirical study using eight types of common web service antipatterns. We compare the implementation of our cooperative P-EA approach with random search, two single population-based approaches and one state-of-the-art detection technique not based on heuristic search. Statistical analysis of the obtained results demonstrates that our approach is efficient in antipattern detection, with a precision score of 89 percent and a recall score of 93 percent

| **ETPL WS - 016** | Consumer oriented web services ranking and classification |
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Web service composition is a process to compose homogenous or heterogeneous services together in order to create value-added services. Many non-functional features including QoS and user preferences have been adopted to guide such a process. However, two issues are observed: (1) the expressiveness of user preference is subject to quantitative preferences without proper use of qualitative preferences; (2) a highly preferred composite service may not be trustworthy, or a highly trustworthy composite service may not be preferable. The existing studies concentrate on either user preference or service trust, and fail to provide a systematic solution to integrate both user preference and service trust together for service compositions. To address these issues, we combine both qualitative and quantitative preferences as well as service trust together in the process of service composition. We investigate the application of heuristic algorithms on multi-objective optimization for the service composition problem. A new hybrid nature inspired intelligent algorithm is also proposed and compared with other popular heuristic algorithms. We aim to obtain optimal web service compositions that can satisfy these (potentially conflicting) constraints as much as possible. Results demonstrate the efficiency and effectiveness of our approach in comparison with other counterparts

| **ETPL WS - 017** | Consumer oriented web services ranking and classification |
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With the services popularity increase and providers number expansion, several web services fulfilling the desired task are available and functional characteristics prove their limits as a selection criteria. To cope with this, many researchers propose architectures and approaches to integrate non-functional features into web services selection process and some of them adopt user preferences centric strategies. We present in this paper a new system for scoring, ranking and classifying web services by their relevancy to well-expressed non-functional requirements (NFRs). The ultimate goal is to assist the user specifying his NFRs, compute scores of candidate web services and provide the rank and class of each to rapidly and optimally recommend the best web service. Experimental results confirm the efficiency of the proposed algorithms and the accuracy of obtained results

| **ETPL WS - 018** | A New QoS-Aware Web Service Recommendation System Based on Contextual Feature Recognition at Server-Side |
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Quality of service (QoS) has been playing an increasingly important role in today's Web service environment. Many techniques have been proposed to recommend personalized Web services to customers. However, existing methods only utilize the QoS information at the client-side and neglect the contextual characteristics of the service. Based on the fact that the quality of Web service is affected by its context feature, this paper proposes a new QoS-aware Web service recommendation system, which considers the contextual feature similarities of different services. The proposed system first extracts the contextual properties from WSDL files to cluster Web services based on their feature similarities, and then utilizes an improved matrix factorization method to recommend services to users. The proposed framework is validated on a real-world dataset consisting of over 1.5 million Web service invocation records from 5825 Web services and 339 users. The experimental results prove the efficiency and accuracy of the proposed method

| **ETPL WS - 019** | Integrated Content and Network-Based Service Clustering and Web APIs Recommendation for Mashup Development |
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The rapid growth in the number and diversity of Web APIs, coupled with the myriad of functionally similar Web APIs, makes it difficult to find most suitable Web APIs for users to accelerate and accomplish Mashup development. Even if the existing methods show improvements in Web APIs recommendation, it is still challenging to recommend Web APIs with high accuracy and good diversity. In this paper, we propose an integrated content and network-based service clustering and Web APIs recommendation method for Mashup development. This method, first develop a two-level topic model by using the relationship among Mashup services to mine the latent useful and novel topics for better service clustering accuracy. Moreover, based on the clustering results of Mashups, it designs a collaborative filtering (CF) based Web APIs recommendation algorithm. This algorithm, exploits the implicit co-invocation relationship between Web APIs inferred from the historical invocation history between Mashups clusters and the corresponding Web APIs, to recommend diverse Web APIs for each Mashups clusters. The method is expected to not only find much better matched Mashups with high accuracy, but also diversify the recommendation result of Web APIs with full coverage. Finally, based on a real-world dataset from ProgrammableWeb, we conduct a comprehensive evaluation to measure the performance of our method. Compared with existing methods, experimental results show that our method significantly improves the accuracy and diversity of recommendation results in terms of precision, recall, purity, entropy, DCG and HMD

| **ETPL WS - 020** | DLTSR: A Deep Learning Framework for Recommendation of Long-tail Web Services |
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With the growing popularity of web services, more and more developers are composing multiple services into mashups. Developers show an increasing interest in non-popular services (i.e., long-tail ones), however, there are very scarce studies trying to address the long-tail web service recommendation problem. The major challenges for recommending long-tail services accurately include severe sparsity of historical usage data and unsatisfactory quality of description content. In this paper, we propose to build a deep learning framework to address these challenges and perform accurate long-tail recommendations. To tackle the problem of unsatisfactory quality of description content, we use stacked denoising autoencoders (SDAE) to perform feature extraction. Additionally, we impose the usage records in hot services as a regularization of the encoding output of SDAE, to provide feedback to content extraction. To address the sparsity of historical usage data, we learn the patterns of developers' preference instead of modeling individual services. Our experimental results on a real-world dataset demonstrate that, with such joint autoencoder based feature representation and content-usage learning framework, the proposed algorithm outperforms the state-of-the-art baselines significantly

| **ETPL WS - 021** | Web Service Recommendation with Reconstructed Profile from Mashup Descriptions |
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Web services are self-contained software components that support business process automation over the Internet, and mashup is a popular technique that creates value-added service compositions to fulfill complicated business requirements. For mashup developers, looking for desired component services from a sea of service candidates is often challenging. Therefore, web service recommendation has become a highly demanding technique. Traditional approaches, however, mostly rely on static and potentially subjectively described texts offered by service providers. In this paper, we propose a novel way of dynamically reconstructing objective service profiles based on mashup descriptions, which carry historical information of how services are used in mashups. Our key idea is to leverage mashup descriptions and structures to discover important word features of services and bridge the vocabulary gap between mashup developers and service providers. Specifically, we jointly model mashup descriptions and component service using author topic model in order to reconstruct service profiles. Exploiting word features derived from the reconstructed service profiles, a new service recommendation algorithm is developed. Experiments over a real-world data set from ProgrammableWeb.com demonstrate that our proposed service recommendation algorithm is effective and outperforms the state-of-the-art methods

| **ETPL WS - 022** | Multi-Dimensional QoS Prediction for Service Recommendations |
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Advances in mobile Internet technology have enabled the clients of Web services to be able to keep their service sessions alive while they are on the move. Since the services consumed by a mobile client may be different over time due to client location changes, a multi-dimensional spatiotemporal model is necessary for analyzing the service consumption relations. Moreover, competitive Web service recommenders for the mobile clients must be able to predict unknown quality-of-service (QoS) values well by taking into account the target client's service requesting time and location, e.g., performing the prediction via a set of multi-dimensional QoS measures. Most contemporary QoS prediction methods exploit the QoS characteristics for one specific dimension, e.g., time or location, and do not exploit the structural relationships among the multi-dimensional QoS data. This paper proposes an integrated QoS prediction approach which unifies the modeling of multi-dimensional QoS data via multi-linear-algebra based concepts of tensor and enables efficient Web service recommendation for mobile clients via tensor decomposition and reconstruction optimization algorithms. In light of the unavailability of measured multi-dimensional QoS datasets in the public domain, this paper also presents a transformational approach to creating a credible multi-dimensional QoS dataset from a measured taxi usage dataset which contains high dimensional time and space information. Comparative experimental evaluation results show that the proposed QoS prediction approach can result in much better accuracy in recommending Web services than several other representative ones

**Thank you!**